

ART. IV.—*The Nomenclature of Chicken Embryos for
Teaching Purposes.*

(With Plates 4, 5, 6 and 7.)

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The method of indicating stages in chicken embryos by the number of hours or days during which the egg has undergone incubation is unsatisfactory, inasmuch as different eggs incubated for the same length of time will be found frequently to contain embryos which have reached by no means similar stages of development.

A more satisfactory method is to give to the successive stages certain fixed and simple designations. This plan was adopted by Balfour in the nomenclature of elasmobranch embryos; and, for teaching purposes, the same system may be adopted with advantage in the case of chicken embryos.

The following indicates, briefly, a series which I have found convenient, and which is being adopted in connection with a students' manual now in course of publication. The stages are based upon the external form, and in this way the embryos may, as in the case of elasmobranch embryos, be classified without recourse to section-cutting, or the examination of the internal anatomy.

Each stage is indicated simply by a letter of the alphabet, and to avoid confusion, the letters *I* and *J* have been omitted.

Stage A.—This includes the early stages, commencing with the appearance of the first segmentation furrow in the germinal disc, and terminating in the formation of the blastoderm. This stage may be said to be passed through by the egg during its descent down the oviduct, and before incubation takes place.

Stage B.—The pellucid and opaque areas become defined, and in the hinder portion of the former, the "embryonic shield" is formed.

Stage C.—The primitive streak and primitive groove are formed, and at the close of the stage, the notochord can be seen passing forwards from the anterior end of the primitive streak.

Stage D.—The neural folds appear; they are widely separate posteriorly, and between them, below the middle of the neural groove, the notochord is clearly seen.

Stage E.—The first pair of mesoblastic somites appear.

Stage F.—Four pairs of mesoblastic somites are present.

Stage G.—Eight pairs of mesoblastic somites are present.

Stage H.—Fourteen pairs of mesoblastic somites are present. This is the last stage in which the long axis of the body of the embryo lies in a straight line.

Stage K.—Eighteen to twenty pairs of mesoblastic somites are present. The body of the embryo is just commencing to be curved at the anterior end. The auditory pits are widely open.

Stage L.—The first gill-cleft appears. Some twenty-four pairs of mesoblastic somites are present. The auditory pit is widely open. The heart lies to the side of the body, and has the form of a tube curved into an S shape. The amnion has grown backwards over the head, nearly to the level of the gill-cleft and the heart.

Stage M.—Three gill-clefts are present. The outline of the body becomes more clearly marked at the posterior end. The amnion encloses the whole head and neck region. The eye is prominent, and the choroid fissure large and well marked.

Stage N.—Four gill-clefts present. The amnion commences to grow forward from the posterior end, and the Wolffian ridge appears on either side.

Stage O.—Four gill-clefts present. The amnion almost completely encloses the body. The limbs appear as broad processes of the Wolffian ridge. On the ventral surface, the allantois appears as a somewhat hemispherical protuberance at the posterior end, and the tail is formed as a blunt curved process. The alimentary canal is nearly closed in.

Stage P.—The embryo lies completely on its left side, and is completely enclosed by the amnion. The allantois forms a prominent sac-like structure. The anterior and posterior limbs are prominent blunt protuberances. The

two olfactory pits are widely open, and a groove from each leads down to the mouth. The fronto-nasal process is not yet well marked.

Stage Q.—The gill-clefts are disappearing. The mid brain forms the most anterior and prominent part of the head. The limbs form prominent blunt processes, of which the anterior are the longer. There is no appearance of digits. The heart is enclosed within the body wall. The eye is deeply pigmented, and the choroid fissure prominent. The allantois stretches round to the dorsal surface. The body is curved, so that the posterior limbs almost touch the head in the region of the cerebral hemispheres. The fronto-nasal process is broad, and the olfactory pits widely open.

Stage R.—The gill-clefts have disappeared. The cerebral hemispheres have grown, and the mid brain is less prominent than in the previous stage. The eye is prominent, and the choroid fissure is not very distinct. The fronto-nasal process begins to be prominent when seen from the side. The anterior limb is curved, so that the proximal and distal halves form a sharp angle with each other, the elbow being thus indicated; the extremity of each limb is flattened out, but there is no clear indication of digits. The tail is clearly marked. The olfactory pits are slit-like, and the mouth much smaller than in the preceding stage.

Stage S.—The head has increased in size very markedly, relatively, to the rest of the body. The eye is very large, and the nictitating membrane appears as a fold. The fronto-nasal processes begins to be drawn out into a beak-like structure, and has almost, if not quite, united on either side with the maxillary process, leaving only the two external nares leading into the olfactory pits. The hind limb shows a well-marked bend, and is longer than the anterior. The anterior limb shows two blunt processes at its extremity, a larger and a smaller, and the posterior limb shows traces of four digits.

Stage T.—The rudiments of feathers appear in the form of a series of rows of knob-like processes on the head, back, ventral surface, tail, and the proximal part of the limbs. The beak is well marked, and has a small whitish knob on its upper surface. The anterior limb shows very clearly, at its extremity, a smaller and a larger process, the latter being divided into two digits. Four digits are very distinct in the posterior limb.

Stage U.—In the anterior limb the smaller process, indicating the first digit, is still very distinct. A special series of processes indicating feathers are developed along the post-axial border, and the third digit begins to become indistinguishable. The arm lies parallel to the long axis of the body, the forearm is bent forward at a sharp angle to this, and the manus projects at right angles to the long axis of the body. In the hind limb, the proximal part is covered with long processes indicating feathers, the middle portion with blunt processes, and the distal portion is developed into a definite foot.

Stage V.—The first digit loses its prominence, and the third one has almost disappeared. The whole is covered with developing feathers. In the hind limb, the middle as well as proximal portion is covered with hair-like processes, still longer than in the preceding stage.

Stage W.—In the anterior limb the first digit can only just be distinguished, and the limb has assumed a wing-like form. In the hind limb the divisions are bent at sharp angles upon one another, and the four digits have assumed very much the adult condition.
